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(54) Title: FLUID HANDLING DEVICE OR PIPETTE HAVING BULB WITH FLATTENED SURFACE

(57) Abstract: In accordance with the present invention, a fluid handling device or pipette for transferring liquids is provided which has a bulb and a hollow cylindrical shaft into which fluids may be drawn, wherein the bulb has at least one flattened side so as to allow ease of use and to facilitate automatic handling, such as in a pouching machine, and in addition to prevent the pipette from rolling when left on a flat surface. Methods for manufacturing and utilizing the device of the invention are also provided.

# FLUID HANDLING DEVICE OR PIPETTE HAVING BULB WITH FLATTENED SURFACE

## CROSS REFERENCE TO RELATED APPLICATIONS

The present application claims the benefit of U.S. Provisional Application Ser. No. 60/917,718, filed May 14, 2007, said application incorporated herein by reference.

## FIELD OF THE INVENTION

The present invention relates to in general to a fluid handling device or pipette for transferring liquids and in particular to a fluid handling device or pipette having a bulb with at least one flattened side so as to allow ease of use and to facilitate automatic handling, such as in a pouching machine, and in addition to prevent the pipette from rolling when left on a generally flat surface.

## BACKGROUND OF THE INVENTION

Graduated pipettes are well known and have long been used in laboratories or in manufacturing facilities to quickly and accurately transfer a specified amount of a liquid. For example, in laboratory tests or experiments in the fields of bacteriology, urinalysis, hematology, chemistry, microbiology and biochemistry, it is often necessary to transport an exact quantity of fluid from one vessel to another. Depending on the nature of the experiment being conducted, the quantity of fluid added or removed is very often critical, and a mistake in quantity can lead to confusing, if not erroneous or detrimental, results. Where the quantities of fluid are relatively small, pipettes are utilized to facilitate the

addition or removal of the fluid. The typical pipette is a device for the drawing and measuring of smaller quantities of fluid, and such devices are generally cylindrical and can be made out of a variety of materials. The pipettes are typically made out of hollow glass or plastic, and are designed for a variety of purposes and uses, such as in manual transfers by lab personnel or automated use in a number of different laboratory and manufacturing processes which require the transfer of fluids. The typical pipette will also be graduated so as to allow for the quantification of fluid when being transferred via the pipette. In the patent arts, such devices are shown, for example, in U.S. patents 4,877,585, 4,054,061, and 3,441,384, all of said patents incorporated herein by reference.

In the classic pipette, the fluid delivery and transfer is accommodated by virtue of the application of suction at the tip of the pipette, generally at the top end of the pipette. Thus, the pipette may be utilized by applying suction to the top end, such as by a mouthpiece or bulb, which allows a quantity of fluid to first be allowed into the pipette, and subsequently releasing the suction pressure to allow the delivery of the fluid from the pipette. The pipette can also be graduated so as to allow the quantification of the fluids entering and exiting the pipette. In terms of the application of suction, for many years it was common for the user to apply suction by mouth, but due to hygienic and precision issues, it generally became more common that the suction was applied by means of a flexible bulb at the top end of the pipette. In the general laboratory setting, bulb-containing pipettes are designed to be used by hand, but because pipettes have a general cylindrical shape, there is a problem in keeping the pipette from rolling when placed on a hard surface such as a lab bench. In addition, pipettes may also be used in

automated devices such as pouching machines, and once again the size and shape of the cylindrical shaft and bulb make it difficult to utilize pipettes in such automated systems wherein slippage and breakage might occur.

There is thus a distinct need for a useful and practical pipette for conducting the transfer of fluids or other similar tasks which can be designed so that it will not readily roll off of a work bench or laboratory surface, and which at the same time can be readily utilized in automatic handling apparatuses such as a pouching machine.

## SUMMARY OF THE INVENTION

It is further an object of the present invention to provide a fluid transfer device or pipette which is designed so as to minimize or eliminate the tendency to roll around such as on the flat surface of a work bench or laboratory table.

It is thus an object of the present invention to provide a fluid transfer device or pipette which is designed so as to facilitate its use in automated handling systems such as pouching machines in which such fluid transfer devices or pipettes are utilized.

These and other objects of the invention are provided by virtue of a fluid handling device or pipette which is constructed with a bulb having at least one flat side which will be useful in preventing the pipette from rolling when used on a flat work bench or laboratory table and which will also facilitate the use of such pipettes in automatic pouching systems or machines and reduce breakage and improve efficiency of such systems. The pipette or fluid handling device of the present invention will thus generally comprise an elongate hollow tube preferably made of glass or plastic which is suitable for the transfer of fluids and will generally have a tapered fluid-dispensing end which is

smaller in diameter than the top end, and a bulb which fits integrally with the top end which has at least one flat surface so that the pipette may be laid on a flat surface without rolling. Since the bulb of the pipette can have one or more flat surfaces, it is possible to configure the bulb in a variety of ways, and thus the bulb may be in a variety of shapes, for example, triangular, square, pentagonal, hexagonal, etc., as long as the bulb retains at least one flat surface which will retard or eliminate the tendency to roll when placed on a generally flat surface such as a lab work bench. Additionally, methods of preparing and utilizing the device of the invention are also disclosed.

Further objects and advantages of the present invention are set forth in the detailed description included below.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a fluid handling device in accordance with the present invention;

Figure 2 is a top view of the device of Figure 1; and

Figure 3 is a side view of the device of Figure 1.

## DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed to a fluid handling device for transferring fluids, such as a pipette. In particular, the invention is directed to a fluid transfer device or pipette having a bulb used in the application of suction so as to fill the device or pipette with a desired fluid, and for applying the necessary force for dispensing the fluid when

so desired, e.g., by squeezing the bulb in order to transfer liquids. In one of the preferred embodiments, the invention is directed to a fluid handling device or pipette comprising a hollow elongate cylindrical shaft having a top or proximal opening of a given diameter and having a tapered opening at the lower or distal end which is smaller in diameter than the opening at said top end, and a bulb that is integral with and/or connected to the top end of the cylindrical shaft, and which has at least one flat face. It is also preferred that the flat face be generally aligned with an outer surface of the cylindrical shaft so as to be able to retard or eliminate the tendency of the cylindrical shaft to roll when located on a generally flat surface. This invention is exemplified in the drawing figures appended hereto wherein like numbers reflect like elements in the different views.

As shown in Figures 1 and 3, an exemplary fluid handling device or pipette 10 made in accordance with the present invention has a generally hollow and elongate cylindrical shaft 12 of a predetermined length. The cylindrical shaft 12 defines a volume 14, e.g., along the entire length of the cylindrical shaft 12. The cylindrical shaft 12 has a lower or distal end 16 defining a tapered opening 18 which will be generally be of a lesser diameter than the diameter at the top at the opposite or proximal end of cylindrical shaft 12. The cylindrical shaft will have an opening at its top or proximal end 20 which will be where a bulb 22 is placed in contact therewith such that the lower end of the bulb fits onto and completely covers the opening at the top or proximal end 20 of the cylindrical shaft 12. As in a conventional pipette, the bulb 22 may have an open lower or distal end which will fit snugly around the proximal end of the shaft 12, and will be made of a flexible material so as to allow it to draw fluid into the shaft 12 by first

pressing or pinching the bulb before the shaft 12 is introduced into a source of fluid and releasing the pressure so that the bulb will return to its original shape and provide a suction force and draw fluid into the pipette. The fluid can be dispensed from the pipette when desired by once again pressing or pinching on the bulb to release the fluid from the pipette.

Alternatively, in addition to the embodiment wherein bulb 22 is a separate piece which is fit snugly onto the cylindrical shaft 12, the bulb 22 may also be integrated with and connected to the shaft so that the pipette or device 10 in accordance with the invention is a single unit or a one-piece device. In such a case, the bulb and cylindrical shaft may be manufactured together by any conventional means, such as blow-molding or other suitable method for making plastic devices, and the bulb in that case will preferably be made of the same material as the cylindrical shaft of the pipette. In accordance with the invention, This embodiment has a barrel with an integrated bulb; and this results in a single blow-molded unit when produced using conventional blow-molding processes. In this embodiment, the tool for the blow mold is preferably machined such that the bulb will contain one flat side as opposed to being cylindrical like the barrel.

In accordance with the present invention, the bulb 22 has at least one flat face 24 which is generally aligned with an outer surface 26 of the cylindrical shaft 12 so as to prevent the pipette 10 from rolling, and thus, the pipette 10 remains in place on a flat work bench, laboratory surface or other similar location. In addition, the flat surface of the bulb 22 of the device 10 facilitates the ability of the device to be used in processes involving automatic handling, such as in an automated pouching machine. In particular,

since the pipettes of the invention may need to be pouched, the handling of such devices in manufacturing has been difficult and has limited the production to only certain types of manufacturing equipment. In the marketing of such devices, they are generally packaged separately, and an included pipette will add substantial costs to the manufacturing procedure, and not just the additional material cost. Traditionally, when one uses generally rounded pipettes, they will tend to roll and will create problems for feeders in pouching machines. These problems are overcome by the pipette with the flattened bulb as used in the present invention.

In the present invention, by virtue of the use of the flat bulb, the pipettes of the invention may be loaded into a conventional pouching machine with no design change to the present pouchers such as the four-seal horizontal pouching machines which make quality humidity-resistant seals with high throughput. The pipette of the present invention may nest with its flat side and thus could be loaded with a bowl feeder or with magazines. The present invention will thus allow for a more efficient pouching process, and in the case of pipettes made of glass materials, such devices may be processed with less breakage.

The fluid handling device of the present invention can be made to accommodate any desired application which may require the use of a pipette or other device in which precise metering of fluids or other materials is required. As such, the present invention can be configured in a variety of sizes suitable to a particular application. In one exemplary specific embodiment of the present invention, the pipette 10 may be made to specific size dimensions, e.g., with a total length of 3.5 inches in total length from the top of the bulb 22 to the bottom end of the pipette 18, as illustrated in Figure 2. In this

embodiment, the bulb 22 is substantially 0.368 inches in diameter, while the cylindrical shaft 12 is substantially 0.184 inches in diameter. As would be recognized by one skilled in the art, devices of all sizes and lengths can be constructed within the scope of the invention.

In another preferred embodiment of the invention, the fluid handling device will contain gradations so as to be useful in properly metering out accurate amounts of fluids when so desired. The gradations may be of any suitable length or distance, and generally involve marking of the external surface of the pipette 10 in regular intervals using any suitable process to affix said marks. In one exemplary embodiment of the present invention as shown in the drawing figures, the device 10 is graduated or marked on the outside surface of the cylindrical shaft 12. For example, a pipette having a 0.5 milliliters (mL) volume could have 0.1 mL graduations, but any suitable designation of specific volumes may be utilized with the pipette of the present invention.

As indicated above, the pipette 10 of the invention will generally be made of a suitable plastic or glass, although other materials could be used as would be known by those of ordinary skill in this art. The pipette 10 of the invention can be made of any of a number of plastics typically used in the medical field wherein such plastics are clear, durable, and should be able to withstand sterilization. For example, the material for the pipette 10 can be an ordinary plastic such as a low density polyethylene (LDPE) plastic, and this includes materials supplied and manufactured by K-Sera, Inc., of Valencia, California. As indicated above, the bulb may be integrated with the shaft of the pipette and thus be made of the same material as the shaft, e.g., LDPE.

Accordingly, single-use pipettes made of LDPE plastic can be sterilized by gas or radiation, can be heat sealed for freezing or use as a transport tube, can be used in freezing temperatures as low as liquid nitrogen, and is safe and convenient to use as there is no risk of breakage or cross-contamination. Further, the bulb will have an internal channel and an opening in communication with an opening of the cylindrical shaft.

As indicated above, the bulb of the present invention will contain at least one flat side so as to retard rolling and improve the ability of the pipette to be used in automated equipment such as a pouching machine. The bulb will normally have a shape so as to be easily manipulable to the user by hand, and will also have one or more flat faces as desired, with each flat face further retarding the tendency of the pipette to roll. Accordingly, any such shape including one flat surface of the bulb is contemplated in the invention. For example, the overall shape of the bulb could be triangular, square, rectangular, pentagonal, hexagonal, etc. as long as it retains at least one flat face.

As also indicated above, the present pipette will feature a bulb that may be comprised of the same material as the remainder of the pipette, e.g., LDPE, or may be a separate piece which is fit snugly onto the shaft. In the latter case, the bulb may be comprised of materials commonly used for such bulbs in conventional pipettes, e.g., rubber or other suitable flexible material such as silicone which can be pressed inward and will return to original shape after it has been depressed. As indicated above, the hollow generally cylindrical shaft of the pipette can be made of any suitable durable generally clear material such as glass or plastic, with plastic materials being preferred for disposable pipettes. Accordingly, one of ordinary skill in the art would recognize that

the construction of the pipette of the present invention may take place using a variety of conventional ways commonly used to manufacture ordinary pipettes, only with the bulb of the present invention being manufactured to contain at least one flat surface as described above.

Similarly, the present invention contemplates a method for transferring fluids using the device of the invention as described above, and the present fluid handling device may be utilized in the same manner as ordinary pipettes, e.g., in the transfer of fluids, particularly when precise metering of said fluids is important. As indicated above, this general method of use will encompass transferring fluids via steps including the drawing of fluid into a pipette as described above, which comprises a cylindrical shaft of a predetermined length which defines a volume and has a tapered opening at a distal end and an opening at an opposite end, and a bulb connected to the proximal end of the cylindrical shaft which has at least one flat face generally aligned with an outer surface of said cylindrical shaft so as to retard or eliminate the tendency of the pipette from rolling when placed on a generally flat surface. Following drawing of the fluid into the pipette of the invention, the fluid is transferred in the manner done with conventional pipettes, namely by applying pressure to the bulb in order to expel the fluid from the cylindrical shaft and transfer it wherever needed.

Accordingly, the present invention contemplates the use of the bulb to provide suction to draw fluid into the pipette, preferably at a precise amount as determined by gradations on the surface of the hollow cylindrical shaft as set forth above, followed by applying pressure to the bulb so as to dispense fluid when appropriate. As indicated above, the present invention can be manufactured and utilized in much the same way

as conventional graduated pipettes well known in the art, but with the improved properties and efficiencies in automated handling systems afforded by the bulb with at least one flat surface as set forth above.

One of ordinary skill in the art will recognize that additional embodiments are possible without departing from the teachings of the present invention. This detailed description, and particularly the specific details of the exemplary embodiment disclosed therein, is given primarily for clarity of understanding, and no unnecessary limitations are to be understood therefrom, for modifications will become obvious to those skilled in the art upon reading this disclosure and may be made without departing from the spirit or scope of the invention.

What is claimed is:

1. A pipette for transferring liquids, comprising:

a cylindrical shaft of a predetermined length, said cylindrical shaft defining a volume and having a tapered opening at a distal end and an opening at a proximal end; and

a bulb in contact with the proximal end of said cylindrical shaft and having an opening at its lower end which fits onto the top end of said shaft, said bulb having at least one flat face, said flat face being generally aligned with an outer surface of said cylindrical shaft so as to retard or eliminate the tendency of the pipette from rolling when placed on a generally flat surface.

2. A pipette according to Claim 1 wherein the bulb has a shape selected from the group consisting of triangular, square, rectangular, pentagonal and hexagonal.

3. A pipette according to Claim 1 wherein the device is suitable for use in an automated pouching machine.

4. A pipette according to Claim 1 wherein the cylindrical shaft is made of a material selected from glass or plastic.

5. A pipette according to Claim 4 wherein the cylindrical shaft is made from a low density polyethylene.

6. A pipette according to Claim 1 wherein the bulb is directly connected to the cylindrical shaft so that the pipette is a single piece.

7. A pipette according to Claim 1 wherein the bulb is made of a flexible plastic material.

8. A pipette according to Claim 7 wherein the bulb is made of a low density polyethylene.

9. A pipette according to Claim 1 wherein the bulb is a separate piece which fits snugly over the proximal end of the cylindrical shaft.

10. A pipette according to Claim 1 wherein the bulb is made of a material selected from rubber and silicone.

11. A pipette according to Claim 1 wherein the bulb is integral with the cylindrical shaft.

12. A fluid handling device, comprising:

a hollow elongate cylindrical shaft having a top opening of a given diameter and having a tapered opening at the lower end, said lower opening being smaller in diameter than the opening at said top end; and

a bulb connected with the top end of said cylindrical shaft so that a suction force provided by said bulb can be transmitted through said cylindrical shaft so as to draw fluid into said shaft, said bulb having at least one flat face, wherein

said flat face will retard or eliminate the tendency of the cylindrical shaft to roll when located on a generally flat surface.

13. A fluid handling device according to Claim 12 wherein the bulb has a shape selected from the group consisting of triangular, square, rectangular, pentagonal and hexagonal.

14. A fluid handling device according to Claim 12 wherein the device is suitable for use in an automated pouching machine.

15. A fluid handling device according to Claim 12 wherein the cylindrical shaft is made of a material selected from glass or plastic.

16. A fluid handling device according to Claim 15 wherein the cylindrical shaft is made from a low density polyethylene.

17. A fluid handling device according to Claim 12 wherein the bulb is directly connected to the cylindrical shaft so that the device is a single piece.

18. A fluid handling device according to Claim 12 wherein the bulb is made of a flexible plastic material.

19. A fluid handling device according to Claim 18 wherein the bulb is made of a low density polyethylene.

20. A fluid handling device according to Claim 12 wherein the bulb is a separate piece which fits snugly over the proximal end of the cylindrical shaft.

21. A fluid handling device according to Claim 12 wherein the bulb is made of a material selected from rubber and silicone.

22. A method of transferring fluids comprising the steps of:

drawing fluid into a pipette for transferring fluids, said pipette comprising:

a cylindrical shaft of a predetermined length, said cylindrical shaft defining a volume and having a tapered opening at a distal end and an opening at a proximal end, and

a bulb connected with the proximal end of said cylindrical shaft and having an opening at its lower end which fits onto the top end of said shaft, said bulb having at least one flat face, said flat face being generally aligned with an outer surface of said cylindrical shaft so as to retard or eliminate the tendency of the pipette from rolling when placed on a generally flat surface; and

applying pressure to the bulb in order to expel fluid from the shaft and to transfer fluid from the pipette.

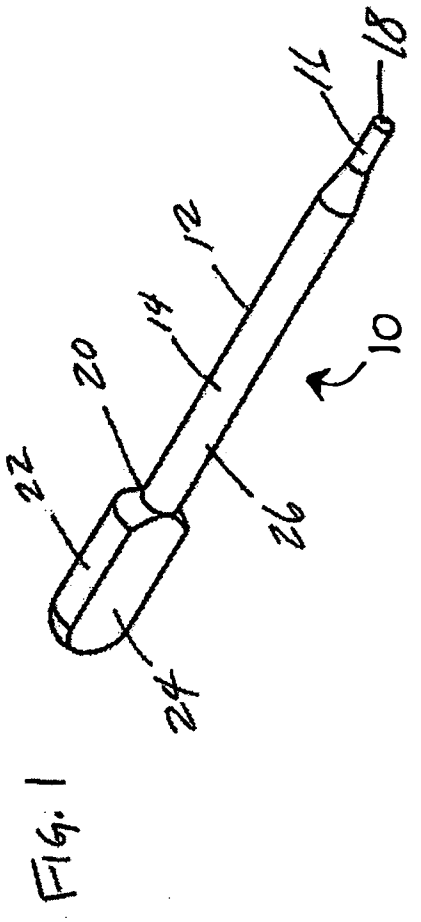


FIG. 1

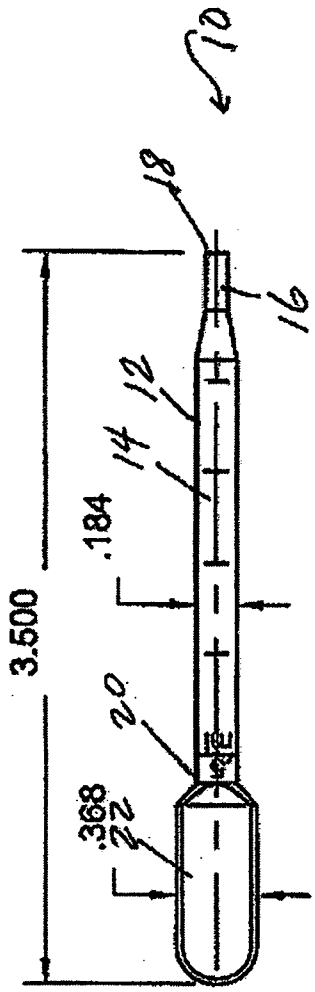


FIG. 2

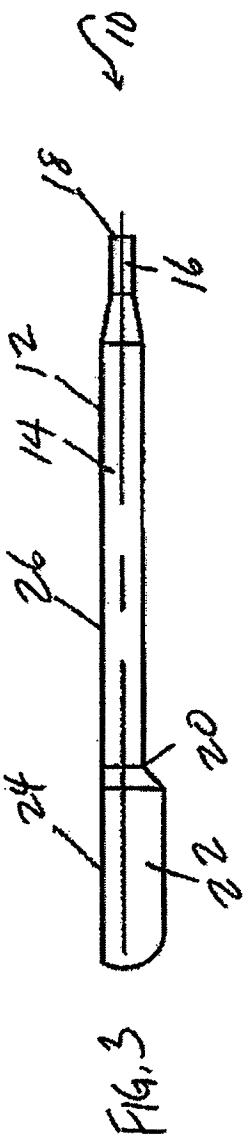


FIG. 3